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RESEARCH PROGRESS AND FORECAST REPORT

1 January 1985

Dr. William B Levy
Department of Neurosurgery
University of Virginia School of Medicine
Charlottesville, VA 22908

Grant #: AFOSR-83-0236 (1 June 84-30 May 85)

Title: Direct Assessment of Synaptic Modification Rules

This report covers the first 210 days of the above-mentioned AFOSR grant.

There have been two personnel changes pertinent to this grant. Dr. Hector Lopez has replaced Dr. Ruth Dickstein on the project in the summer of 1984. Some time has been spent training Dr. Lopez for the techniques unique to our laboratory. In addition, we have hired a 3/4 time laboratory technician (Mary Sigurdsson) to help in the research.

We have spent considerable time reprogramming our computer programs for data acquisition and evaluation. This is an important effort since we were previously unable to study simultaneously the synaptic response and the cell discharge. This improvement has become particularly critical since the ongoing evaluation of data gathered last year shows strong support for the existence of two distinct adaptive processes. One process modifies the synaptic response, and another adaptive process modifies the conversion of synaptic current into cell firing. Note that this improvement in data gathering is an on-going task.

We are continuing our study (i.e., data gathering and evaluation) of the quantitative manner in which asymptotic changes are induced independently at neighboring synapses. This study has at least two important implications. First, it corroborates our earlier claims that we are studying a process of individual synaptic modification. Second, it helps to establish the experimental conditions which allow us to distinguish a variety of adaptive modification processes.

Another development is the closer relationship between our NIH sponsored research and our work for the Air Force. As we find out more about the cellular basis of synaptic modification, we see more and more confirmation for our theoretical ideas about adaptive synaptic modification. In particular, there is individual modification of individual synapses.

Finally, we have continued our theoretical work which considers various interpretations of the adaptive processes we have experimentally observed. The context of this interpretation now

centers on optimally performing, adaptive pattern recognition systems. We are encouraged by the performance shown by multiplicative, recursive neural networks.